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TECHNICAL SUPPORT FOR ROCKY MOUNTAIN ARSENAL

Offpost Interim Response Action and
Remedial Investigation/Feasibility Study
Draft Final Health and Safety Plan

August 1989
Contract Number DAAA15-88-D-0021/0001
RIFS1

PREPARED BY:
HARDING LAWSON ASSOCIATES

PREPARED FOR:
PROGRAM MANAGER FOR
ROCKY MOUNTAIN ARSENAL

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THE INFORMATION AND CONCLUSIONS PRESENTED IN THIS REPORT REPRESENT THE OFFICIAL POSITION OF THE DEPARTMENT OF THE ARMY UNLESS EXPRESSLY MODIFIED BY A SUBSEQUENT DOCUMENT. THIS REPORT CONSTITUTES THE RELEVANT PORTION OF THE ADMINISTRATION RECORD FOR THIS CERCLA OPERABLE UNIT.

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1.0 INTRODUCTION

It is Harding Lawson Associate's (HLA's) intent to protect and promote the health and well-being of its employees and others by providing a safe and healthy work environment at all project sites. This Health and Safety Plan (HSP) details procedures for complying with federal, state, local, HLA, and U.S. Department of the Army health and safety regulations for protecting personnel, equipment, materials, and property during this investigation.

All safety equipment and procedures utilized during this investigation will comply with rules, regulations, and standards issued by the Occupational Safety and Health Administration (OSHA), the U.S. Environmental Protection Agency (EPA), the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute, and the Mine Safety and Health Administration.

2.0 SAFETY ADMINISTRATION AND ORGANIZATION

Health and safety within HLA is managed through the corporate Industrial Hygiene and Safety Division in Novato, California. Mr. Peter Rice, Corporate Manager of Health and Safety, is responsible for coordinating all health and safety activities within the company. Mr. Rice serves as project consultant on health and safety issues relating to this project.

Each branch office has a Designated Health and Safety Officer (DHSO). The DHSO for HLA's Denver office is Mr. Marcus Johnshoy, CIH. Each DHSO is responsible for implementing corporate directives and policies within each office, ensuring compliance with federal and state regulations, and coordinating area office health and safety activities. In the Denver office, the DHSO reports directly to the Office Manager, Dr. Arthur Riese, on all local health and safety issues.

The Task Manager for this investigation is Mr. Stephen Farley, who will be responsible for all aspects of this task, including health and safety. Mr. Farley has designated Mr. Marcus Johnshoy as Health and Safety Coordinator for this task. Mr. Johnshoy will be responsible for preparing, implementing, and monitoring the effectiveness of health and safety procedures and equipment.

3.0 BACKGROUND OF ROCKY MOUNTAIN ARSENAL OPERATIONS

RMA is located northeast of Denver in Adams County. RMA was established in 1942 as a facility for the manufacture of chemical munitions. From the 1940s to the early 1980s, the site was used for chemical manufacturing and demilitarization of munitions. Industrial and waste disposal practices of both the Army and lessees during that time have resulted in soil, surface-water and ground-water contamination both onpost and offpost. As a result, the RMA site was added to the National Priorities List (NPL) in 1987 and is subject to compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Investigations were initiated at RMA to identify potential areas of onpost soil contamination, probable contaminant migration pathways, and areas of ground-water contamination. Those investigations indicated historical migration of contaminants to offpost areas. Based on the results of these investigations, three onpost ground-water interception, treatment, and recharge systems were designed and installed to prevent the migration of contaminated ground water to offpost areas. These systems inhibit the migration of RMA contaminants along the northern, northwestern, and western boundaries of RMA and together treat and recharge approximately one billion gallons of ground water annually. The Final Remedial Investigation (RI) Report (ESE, 1988) identified chemical plumes offpost to the north and northwest.

4.0 HLA'S APPROACH TO HEALTH AND SAFETY FOR RIFS1

The primary pathway of contaminant transport to the offpost study area is ground-water flow from RMA. This is the major factor in determining the necessary personal protection for field personnel. Tasks that involve non-invasive methods (e.g., geophysics, surface-soil and surface-water sampling, and surveying) will be conducted in basic field clothing. Geophysics and surface-soil sampling usually involve disturbing the top 1 to 3 feet of soil. These activities will be monitored with an HNu photoionization detector (HNu). As necessary, personal protection will be upgraded. A higher level of personal protective equipment (PPE) will be required for all invasive techniques, which will penetrate to the water table. These include monitoring-well installation and monitoring-well sampling. Although monitoring-well installation may begin in field clothing, as soon as the borehole is within a few feet of the water table or whenever breathing zone contaminants are identified by HNu monitoring, personal protection will be upgraded immediately.

The effectiveness of this approach will be evaluated through a regular program of personal monitoring for breathing zone contaminants. If necessary, the personal protection dictated by this HSP will be modified to reflect additional health and safety concerns.

5.0 HEALTH AND SAFETY PLAN FORMAT

The HSP for the RMA offpost study area describes the health and safety aspects of field operations, including hazard analysis, risk assessment, PPE, and emergency information. The HSP was developed using HLA's standard Job Safety Plan, which is a "fill in the blank" form. The use of a standardized form ensures that health and safety planning is performed consistently and completely and provides a single source of health and safety information for use by onsite personnel. The HLA Job Safety Plan which is included as Section 6.0 of this document is a formal method of identifying the hazards associated with a project, analyzing risks, and selecting measures to control hazards so that the job can be completed safely. Supporting information is included in attached appendices to the Job Safety Plan, listed as follows:

- A - Hazardous Property Information**
- B - Health and Safety Program**
- C - Equipment Calibration and Preventative Maintenance**
- D - Respiratory Protection Program**
- E - Acronyms and References**

6.0 JOB SAFETY PLAN

This job safety plan is specifically prepared for:

Project location: Rocky Mountain Arsenal (offpost)

Job number : 20000,610.10

The primary hazards on this job are expected to be: Exposure to volatile and semivolatile organic and pesticide compounds in ground water and mechanical hazards during installation of monitoring wells.

Required personal protective equipment for this project: Polyethylene-coated tyvek or polypropylene coveralls, steel-toed, chemical-resistant boots and overbooties; inner and outer gloves; full-face air-purifying respirator with organic vapor/HEPA/pesticide cartridge; hardhat; and safety glasses.

All personnel participating in the field investigation must be trained in the general and specific hazards unique to the job, and if applicable, meet recommended medical examination requirements.

This plan is prepared to inform all field personnel, including HLA contractors and HLA subcontractors, of the potential hazards on the site. However, each contractor or subcontractor must assume responsibility for his own employees' health and safety.

**HARDING LAWSON ASSOCIATES
JOB SAFETY PLAN**

1. Site: Rocky Mountain Arsenal (RMA) 2. Job No.: 20000,610.10
Offpost area to the north and west

3. Location: Immediately north of RMA and east of
Commerce City, Colorado, in Adams County

4. Plan Prepared: D. Anita Meenan Date June 9, 1989

5. Approved: _____ Date
Stephen M. Farley
Project Manager

_____ Date
Marcus W. Johnshoy
Denver Health and
Safety Officer

6. Plan Revised:

7. Plan Revised:

8a. Site Description: Open, undeveloped land immediately north and west of RMA in southern Adams County, Colorado (see Figure 1).

8b. Previous Health and Safety Concerns: Investigative activities to assess the nature and extent of offpost contamination have been performed over the last two decades. Most recently, ground-water monitoring wells have been installed, aquifer testing has been conducted, and ground-water and surface-water samples have been collected and analyzed. Sediments, surface soils, and deep soils have not been extensively analyzed. Previous health and safety concerns have generally been limited to (1) volatile organics and pesticides in ground water released to the atmosphere while installing or sampling monitoring wells and (2) dermal contact with contaminated water. Areas of potential contamination are shown in Figure 2.

9. Status (active, inactive, unknown): Open, undeveloped land.

10. Surroundings (location with respect to residences, businesses, natural features, etc.):

The offpost operable unit is triangular in shape. RMA borders the southeast, and Commerce City borders the southwest. The northeast border is defined by Second Creek and the northwest border by the South Platte River (see Figure 1). Both the study area and areas to the northwest and northeast are open pasture/farmland with scattered residences.

11. Site map (attach map showing salient features, including location of HLA's work and location of specific health and safety concerns). See Figure 1

EXPLANATION

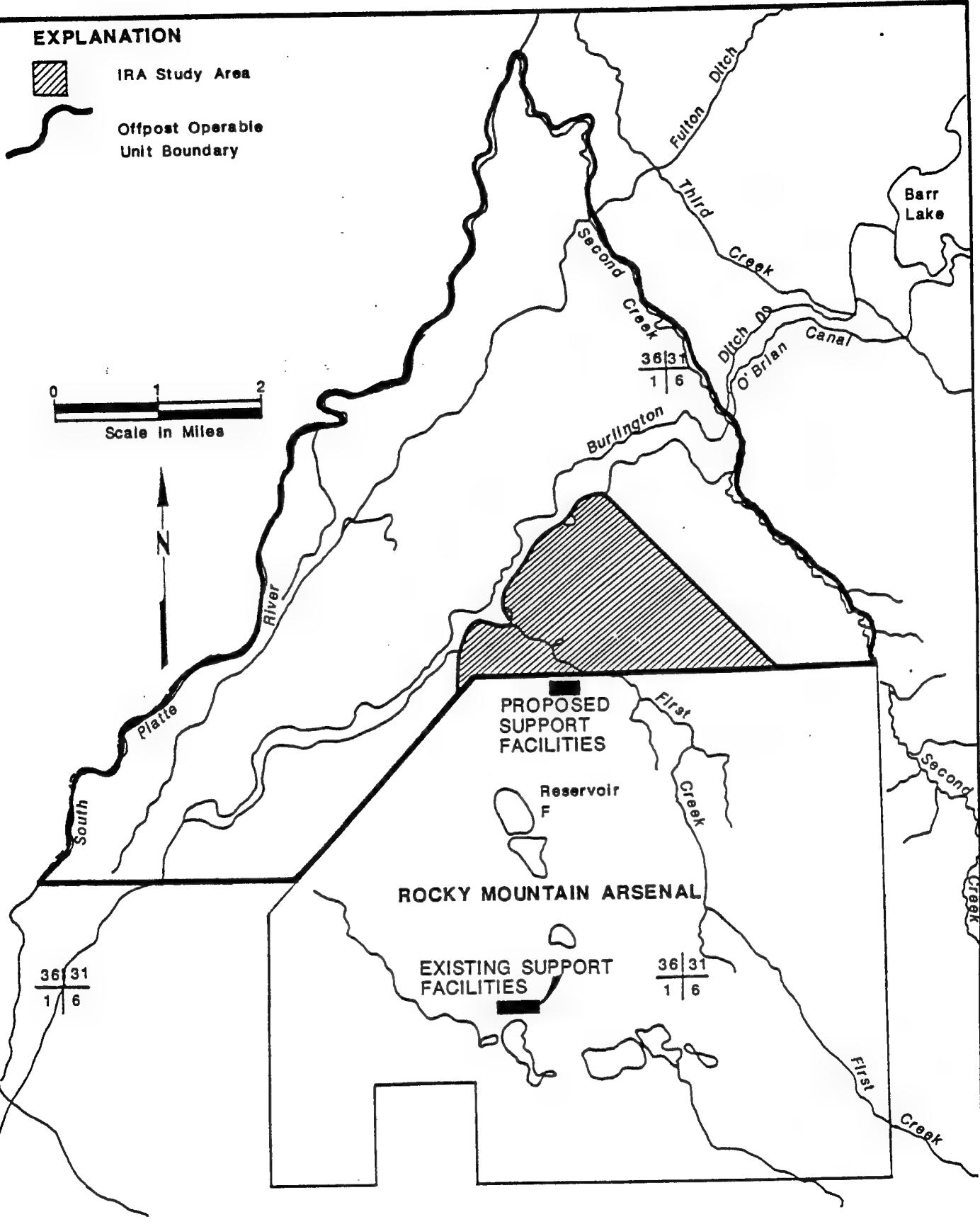


IRA Study Area



Offpost Operable
Unit Boundary

0 1 2
Scale In Miles

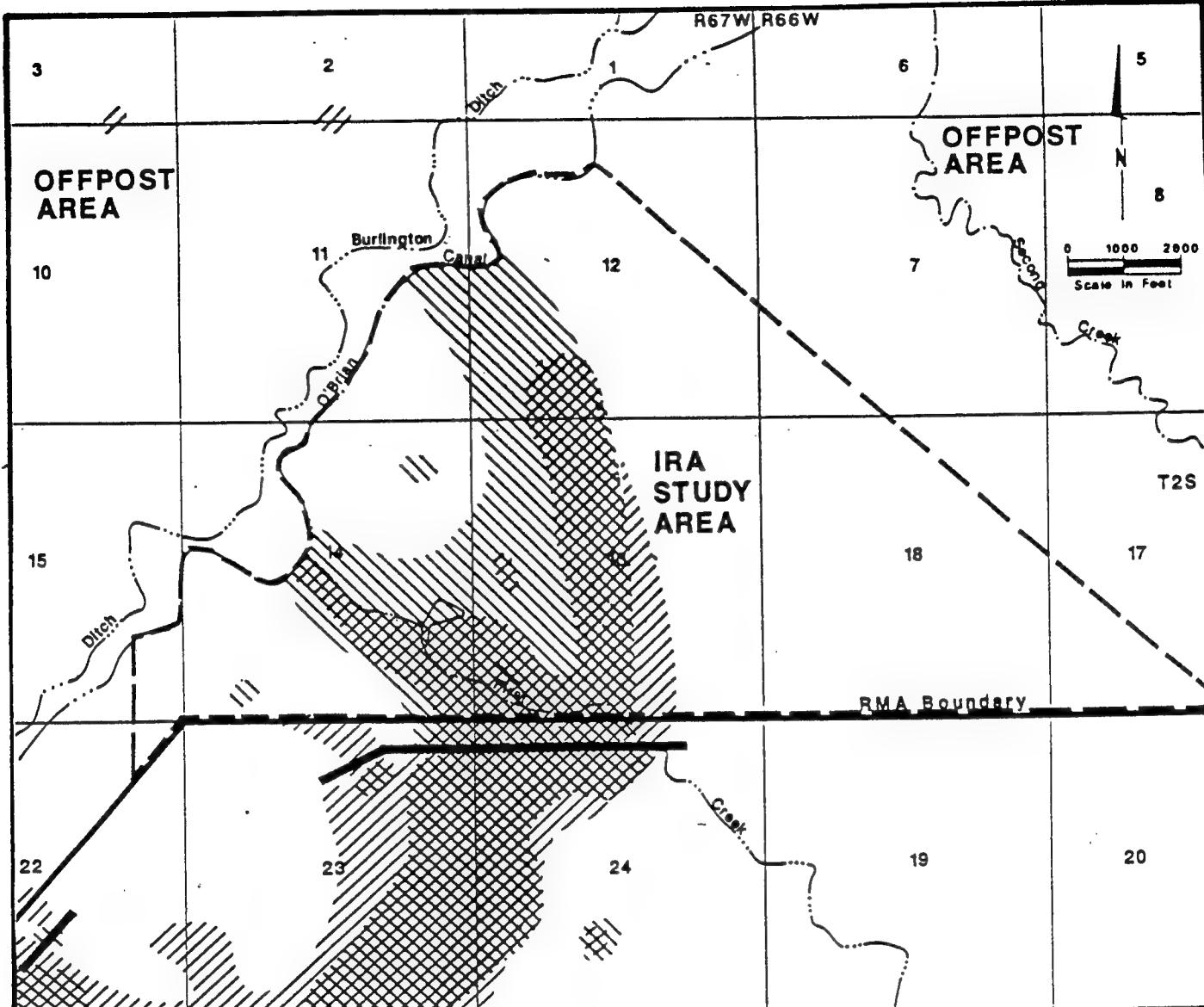


Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal Cleanup
Commerce City, Colorado

Figure 1
STUDY AREA

PREPARED BY: HARDING LAWSON ASSOCIATES

20000,610.10



EXPLANATION

- Boundary Containment System
- RMA Boundary
- - - IRA Study Area Boundary
- [Diagonal hatching] Area of Volatile Organic Compounds and DBCP (Benzene, CCL4, DBCP, TCE, TCLEE)
- [Cross-hatching] Area of Pesticides (Aldrin, Dieldrin, Endrin)

Reference : Draft Offpost RI Report (ESE, 1988)

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal Cleanup
Commerce City, Colorado

Figure 2
MAXIMUM EXTENT OF SELECTED
CONTAMINANTS IN THE
ALLUVIAL AQUIFER
PREPARED BY: HARDING LAWSON ASSOCIATES
20000,610.10

12. Climate

12a. Average wind speed and direction: Approximately 10 mph from the south

	July	October	January	April
12b. Mean High Temperature (°F) :	88°	66.8°	43.1°	61.0°
Mean Low Temperature (°F) :	57°	36.9°	29.0°	33.7°

13. Site history (origin of reported contamination and history of injuries, exposure, chemical spills, complaints, etc.): See discussion of RMA onpost and offpost history in Section 3.0 of this Health and Safety Plan.

14. Description of HLA's work: HLA will investigate the offpost area north and northwest of RMA. This investigation will involve soil sampling, ground-water sampling of existing and proposed wells, installation of monitoring wells, surface-water sampling, and the use of geophysics to delineate paleochannels.

15. Chemicals

15a. List chemical constituents that have been identified, their concentration, and the environmental media in which they are present. Hazardous property information for these chemicals appears in Appendix A, Table 1. Review this information for all chemicals listed below.

For comparison, EPA's promulgated and proposed limits for drinking water are listed in Appendix A, Table 2.

Table 1 shows the maximum measured concentrations for the identified contaminants of concern in the offpost area, exclusive of non metallic inorganics.

15b. Has the system been adequately characterized to the best of your knowledge?

Yes: x No:

If yes, list applicable references or previous reports/studies.

Previous investigations were conducted, most recently by Environmental Science and Engineering, Inc., R. L. Stollar and Associates, Inc., Ebasco Services, Inc., and HLA. Reports prepared by these companies are available at the Rocky Mountain Arsenal Information Center (RIC). Selected publications are listed below.

1. Rocky Mountain Arsenal Offpost Assessment Ground Water Quality Report for Sampling Period December 1984 Through January 1985, Volume I, Environmental Science and Engineering, October 11, 1985, RIC #87016R02
2. Rocky Mountain Arsenal Offpost Assessment Ground Water Quality Report (Consumptive Use-Phase II) for Sampling Period September Through October 1985, Environmental Science and Engineering, August 1986, RIC #87016R03

Table 1: Maximum Measured Concentration (mg/l or ppm)¹

<u>Chemical</u>	<u>Environmental Media</u>		
	<u>Ground Water</u>	<u>Surface Water</u>	<u>Soil</u>
Aldrin	.00036	ND ²	0.034
Arsenic	.0039	.0209	7.17
Benzene	.0229	ND	ND
Cadmium	.008	.0286	0.926
Chloroform	1.5	.200	ND
Chlorophenyl methyl sulfone	ND	.315	ND
Chromium	.024	.0313	17.5
Copper	.026	.0321	26.1
DBCP	.0133	ND	0.24
DCPD	.236	ND	ND
1,2-Dichloroethane	.0137	ND	11.2
Dieldrin	.00162	.00147	0.052
Diisopropyl methyl phosphonate	5.388	.0131	ND
Endrin	.00089	.0004	0.07
Lead	.074	.0312	24.4
DDT	.00016	ND	0.23
Tetrachloroethylene	.0022	ND	ND
Trichloroethylene	.00706	ND	ND
Zinc	.0939	.0933	194.0

¹Listed concentrations are from the most recent offpost sampling events: Winter 1987/88 and Spring 1988 for ground water and November 1988 for soils/sediments and surface water. It should be noted that data from the latter two media are preliminary and have not undergone QA/QC review at the time this Health and Safety Plan was prepared.

²ND - Not Detected

3. Continued Offpost Ground Water Monitoring Program (Revision III-360° Monitoring Program) Rocky Mountain Arsenal, Environmental Science and Engineering, February 1986, RIC #87016R05
4. Remedial Investigation Program Draft Final Phase I, Introduction to the Contamination Assessment Reports, Version 2.3, Environmental Science and Engineering, April 1987, RIC #88204R02
5. Offpost Operable Unit Remedial Investigation and Chemical Specific Applicable or Relevant and Appropriate Requirements, Final Report, Version 3.1, Environmental Science and Engineering, December 1988, White cover.
6. Offpost Operable Unit Endangerment Assessment/Feasibility Study with Applicable or Relevant and Appropriate Requirements, Draft Final Report, Version 2.1, Environmental Science and Engineering, et al., March 1989, Brown cover.

16a. Hazard Analysis:

List all activities in the Job Activity Column and assign a number to activity (example: 1. Soil Sampling). Identify how each category of hazard exists at each task.

Job Task	Mechanical	Electrical	Chemical	Temperature	Acoustical	Radioactive	O ₂ deficiency	Biohazard
1. Monitoring-Well Installation	Drill rig	Electrical storms, overhead lines	Toxins in subsurface, surface, and/or air	Hypothermia or hyperthermia	Drill rig	NA	NA	Mosquitoes & other insects, poison oak/ivy
2. Monitoring-Well Sampling	Generator, compressor pump	Electrical storms, generator	Toxins in subsurface, surface, and/or air	Hypothermia or hypothermia	Generator	NA	NA	Mosquitoes & other insects, poison oak/ivy
3. Surface-Water Sampling	None	Electrical storms	Toxins in surface and/or air	Hypothermia or hyperthermia	None	NA	NA	Mosquitoes & other insects, poison oak/ivy
4. Borehole Soil Sampling	Drill rig	Electrical storms, overhead lines	Toxins in subsurface, surface, and/or air	Hypothermia or hyperthermia	Drill rig	NA	NA	Mosquitoes & other insects, poison oak/ivy
5. Surface and Shallow Soil Sampling	None	Electrical storms	Toxins in subsurface, surface, and/or air	Hypothermia or hyperthermia	None	NA	NA	Mosquitoes & other insects, poison oak/ivy
6. Geophysics	None	Electrical storms	Toxins in surface and/or air	Hypothermia or hyperthermia	None	NA	NA	Mosquitoes & other insects, poison oak/ivy
7. Surveying	None	Electrical storms	Toxins in surface and/or air	Hypothermia or hyperthermia	None	NA	NA	Mosquitoes & other insects, poison oak/ivy

16b. Risk Analysis

Hazard	Task	Exposure ¹	Probability ²	Consequence ³
<u>Mechanical</u> - drill rig	Monitoring-well installation Borehole Soil sampling	CONT	UNU	MIN-FATAL
<u>Electrical</u> - powerlines	Monitoring-well installation Soils sampling	SELD	UNU	MOD-FATAL
<u>Electrical</u> - storms	All tasks	OCC	UNU	MOD-FATAL
<u>Chemical</u> - toxins in air	Monitoring-well installation Ground-water sampling Surface-water sampling Soils sampling	FREQ	LIKE	CHRON-MIN
<u>Chemical</u> : toxins in ground water	Ground-water sampling Monitoring-well installation	FREQ	LIKE	CHRON-MIN
<u>Chemical</u> - toxins in surface water	Surface-water sampling	FREQ	LIKE	CHRON-MIN
<u>Chemical</u> - toxins in soil	Soil sampling	FREQ	LIKE	CHRON-MIN
<u>Temperature</u> - hyperthermia, hypothermia	All tasks	FREQ	LIKE	MIN-FATAL
<u>Acoustical</u> - generator, drill rig	Ground-Water sampling Monitoring-well installation Soil sampling	CONT	UNU	CHRON

1 Exposure:

- a. CERT
 b. FREQ
 c. OCC
 d. SELD
- Continuously - many times daily
 Frequently - once/day or twice/day
 Occasionally - once/week to once/month
 Seldom - once/month to once/year

2 Probability: The likelihood that an injury will occur upon exposure to the hazard event

- a. CERT
 b. LIKE
 c. UNU
 d. IMP
- Certain or almost certain
 Likely, not unusual, 50/50 chance of occurring
 Unusual, would happen less often than not
 Improbable, not likely to happen

3 Consequence: The degree of injury resulting from exposure to the hazard event if an injury occurs

- a. FATAL
 b. SER
 c. MOD
 d. MIN
 e. CHRON
- Fatality
 Serious injury, including chemical exposure requiring hospitalization
 Moderate injury, including chemical exposure requiring outpatient medical treatment
 Minor injury, including chemical exposure requiring onsite first aid
 Chemical, acoustical, or other exposure above TLV or other recommended standard that may not produce immediate acute effects (especially for chronic toxicants)

17. Procedures to mitigate hazards:

Identify procedures to mitigate all hazards listed in Item 16 by placing the task number next to the appropriate mitigating measure. Listing of standard procedures is not inclusive. A specific procedure must be entered to mitigate each hazard identified in Item 16.

Activity <u>List Number</u>	Mechanical Hazards
<u>N/A</u>	- Do not stand near backhoe buckets and earth moving equipment.
<u>1-7</u>	- Verify that all equipment is in good condition.
<u>N/A</u>	- Do not stand or walk under elevated loads or ladders.
<u>N/A</u>	- Do not stand near unguarded excavation and trenches.
<u>N/A</u>	- Do not enter excavation or trenches over 5 feet deep that are not properly guarded, shored, or sloped.
<u>1-7</u>	- Consult DHSO if other mechanical hazards exist.

Electrical Hazards

<u>1.4</u>	- Locate and mark buried utilities before drilling.
<u>1.4</u>	- Maintain at least 10-foot clearance from overhead power lines.
<u>1.4</u>	- Contact utility company for minimum clearance from high-voltage power lines.
<u>1.4</u>	- If unavoidably close to buried or overhead power lines, have power turned off with circuit breaker locked and tagged.
<u>1.2,4</u>	- Properly ground all electrical equipment.
<u>1.2,4</u>	- Avoid standing in water when operating electrical equipment.
<u>1.2,4</u>	- If equipment must be connected by splicing wires, make sure all connections are properly taped.
<u>1.2,4</u>	- Be familiar with specific operating instructions for each piece of equipment.

Chemical Hazards

<u>1-7</u>	- Use personal protective equipment indicated in Section 18.
<u>1.2,4</u>	- Conduct direct reading air monitoring to evaluate respiratory and explosion hazards (list instrument, action level, monitoring location, and action to be taken in Section 19).
<u>1.2,4</u>	- Consult DHSO for personal air monitoring.

Temperature Hazards

Heat Stress

1-7

- When temperature exceeds 70°F, take frequent breaks in shaded area. Unzip or remove coveralls during breaks. Have cool water or electrolyte replenishment solution available. Drink small amounts frequently to avoid dehydration. Count the pulse rate for 30 seconds as early as possible in the rest period. If the pulse rate exceeds 110 beats per minute at the beginning of the rest period, shorten the work cycle by one-third..

Cold Stress

1-7

- Wear multilayer cold weather outfits. The outer layer should be of wind resistant fabric.

1-7

- 0° to -30°F total work time is 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area. Below -30°F, consult industrial hygienist.

1-7

- Drink warm fluid. Provide warm shelter for resting. Use buddy system. Avoid heavy sweating.

Acoustical Hazards

1,2,4

- Use earplugs or earmuffs when noise level prevents conversation in normal voice at distance of three feet.

Biohazards

1-7

N/A

N/A

1-7

N/A

- Poison oak, poison ivy.
- Infectious waste.
- Rabid animals, poisonous reptiles. Wear heavy gloves and coveralls when working with animals. Approach trapped animals with caution.
- Ticks, mosquitoes, and other insects (disease carriers or poisonous).
- Biological or animal laboratories.

Action: Field personnel will be taught to recognize poison oak and poison ivy. Insect repellants will be used as necessary.

18. Required Personal Protective Equipment (PPE)

All onsite tasks will be initiated using Level D or Modified Level D PPE; however, upgrading to Level C is anticipated at select locations.

Level D: PPE

Cloth coveralls/field clothes
Inner gloves
Safety glasses
Steel-toed chemical-resistant boots or leather work boots (use of butyl rubber overbooties dependent on site conditions and the likelihood of working in wet areas)

Modified Level D: PPE

Polypropylene coverall, light blue
Inner glove and nitrile outer glove
Hardhat
Safety glasses
Steel-toed chemical-resistant boots (with butyl rubber overboot if using leather work boots)
Foam earplugs (when necessary)

Level C: PPE

Polypropylene coverall, light blue
Inner glove and nitrile outer glove
Hardhat
Safety glasses
Steel-toed chemical-resistant boots (with butyl rubber overboot if using leather work boots)
Foam earplugs (when necessary)
Full-face or half-face air-purifying respirator¹ with organic vapor/HEPA/pesticide cartridges (change daily)

For Modified Level D, the protective outer clothing is a blue polypropylene one-piece coverall. Chemical resistance of this fabric (as measured by breakthrough time and permeation rate data) is nearly identical to that of uncoated tyvek. Use of an air-purifying respirator with this polypropylene suit (along with the other PPE listed for Modified Level D) will constitute Level C protection.

If breathing zone concentrations of volatile organic chemicals equal or exceed 5 ppm as measured by an HNu, Level B protection will be employed. This will consist of a hooded, gray polyethylene-coated tyvek suit, self-contained breathing apparatus (SCBA), inner and outer gloves, steel-toed chemical-resistant boots, and overbooties.

The PPE for each task outlined in Section 16a is presented below.

¹Use of respirator dependent on organic chemical concentrations in breathing zone greater than background and less than 5 ppm as determined by HNu monitoring (see Section 19). Use of respirator will constitute Level C PPE.

Task 1 - Monitoring-Well Installation

Modified Level D

Note: Task 1 may begin in Level D PPE. Modified Level D or Level C will be employed when boring reaches one foot above water table or at any time HNu readings indicate a need to upgrade.

Task 2 - Monitoring Well Sampling

Level D

Note: Use of Level D will be based on existing analytical data for each well sampled. Wells that historically have not shown evidence of contamination may be sampled using Level D PPE. Ambient air monitoring with an HNu will be performed during sampling. If monitoring indicates breathing zone concentrations of greater than background to 5 ppm, PPE will be upgraded to Level C.

For wells that have historically contained contaminants, sampling will begin in Modified Level D. PPE will be upgraded to Level C or B as necessary, based on HNu monitoring, the presence of odors, or unexpected visual observations. PPE may be downgraded to Level D if HNu monitoring does not indicate the presence of breathing zone contaminants during sampling.

Task 3 - Surface-Water Sampling

Level D

Task 4 - Borehole Soil Sampling

Level D

Task 5 - Surface and Shallow Soil Sampling

Level D

Task 6 - Geophysics

Level D

Task 7 - Surveying

Level D

Other Safety Equipment

Tasks 1-5: Traffic cones or flagged stakes will be used to mark an area 60 feet in diameter to be designated as the exclusion zone, where appropriate. Use of markers during Tasks 3 and 5 is dependent on the duration of the activity and necessity of excluding unauthorized personnel.

Tasks 1-7: Traffic cones will be placed for traffic control at any location proximal to a public roadway.

19. Action Levels

A. Protection Levels

1. Unknown Constituents

For totally unknown or unanticipated situations, the following levels of protection should be utilized:

Breathing Zone HNu/OVA Reading for 1 minute

Background	Level D
>Background-<5 ppm	Level C
5-<500 ppm above background	Level B
500-1000 ppm above background	Level A

Note: Level A protection (totally encapsulated chemical protective suit) is not expected to be necessary during this investigation. Level B is also not expected to be required.

2. Known or Suspected Constituents

Instrument and Date of Calibration	Calibration Standard	Span Setting/Gas Select	Action Level Above Background (Breathing Zone)	Action
HNu	Isobutylene	9.8	Any level above background	Don respirator (Level C)
			5 ppm and above	Leave area (Level C)
			5 ppm and above	Upgrade to Level B
			500 ppm to 1000 ppm	Upgrade to Level A

B. Explosion Hazard

Instrument and Date of Calibration	Action Level Above Background (Ambient Air)	Action
Combustible gas indicator	Greater than 20% LEL	Leave area
N/A - Explosive atmospheres are not expected during field work		

C. Oxygen Deficiency

Instrument and Date of Calibration	Action Level (Ambient Air)	Action
O ₂ meter	Less than 19.5% O ₂ More than 25% O ₂	Do not enter
N/A - Oxygen-deficient or oxygen-enriched atmospheres are not expected during field work		

D. Other Instruments

Instrument and Date of Calibration	Reading Location	Action
<u>Date</u>		
Draeger pump/tubes	N/A	
Radiation monitor	N/A	
Heat stress meter	N/A	
Noise meter	N/A	
H ₂ S meter	N/A	
Others:	N/A	

20. Site Control/Work Zones

Describe location of exclusion zone, hot line, contamination reduction zone, and decontamination area and other control procedures(s). Show location on site plan.

Each well installation site or sampling site will be considered an individual exclusion zone. All personnel within 30 feet of the site will be required to don the appropriate PPE, depending on HNu readings. Exclusion zones will be marked by traffic cones or flagging

whenever feasible. The location of the contamination reduction zone (CRZ) will vary depending on the task being conducted, and may be immediately outside of the exclusion zone at each work site, or may be at the base trailer.

21. Decontamination Procedures

21a. Equipment Decontamination:

Temporary decontamination facilities will be available at each sampling/installation site. All small downhole equipment and/or sampling equipment will be washed with Alconox (or equivalent) and triple-rinsed with distilled water at each site. Larger equipment will be decontaminated at the onpost decontamination pad.

21b. Personnel Decontamination:

All personnel who enter the exclusion zone will remove outer PPE (if used) and contaminated gloves before leaving the site. Inner boots and gloves will be rinsed, as appropriate, and hands will be washed before entering the support zone.

22. Investigation-Derived Material Disposal

Drill cuttings/well water: Barreled, labeled, numbered, and stored at RMA in accordance with existing plans developed for the Comprehensive Monitoring Program

Decontamination solutions: Barreled, labeled, numbered, and stored at RMA in accordance with existing plans developed for the Comprehensive Monitoring Program

Protective clothing: Barreled, labeled, numbered, and stored at RMA in accordance with existing plans developed for the Comprehensive Monitoring Program

Other:

23. Site Resources

Toilet facilities: Base trailer at North Gate

Drinking water supply: Base trailer and at each work site

Telephone: Base trailer

Radio: CB radios at all work sites

Storage: Storage trailer near base trailer

Note: The base trailer will be located at a designated area along the north gate. Additional facilities currently located at the South Plants location will also be utilized.

24. Required Emergency Equipment Location

Safety shower/eyewash: Portable shower/eyewash units at base trailer. Deionized water for emergency eyewash at each work site.

First aid kit: Base trailer and at each work site.

Fire extinguisher: Base trailer and at each work site.

Other:

25. Emergency Telephone Numbers:

Ambulance: 1-911 **Air Life** (303) 360-3400

Police: 1-911

Fire department: 1-911

Hospital: Aurora Presbyterian (303) 363-7200
Fitzsimons (303) 361-8713

Client Contact: Charles T. Scharmann, PM-RMA (303) 289-0201

Poison Control Center: (303) 629-1123 (local)

Project Manager: Stephen Farley **Office:** (303) 894-9878

DHSO: Marcus Johnshoy **Office:** (303) 894-9878 **Home:** (303) 344-5691

26. Emergency Routes: Attach map showing route to nearest hospital:

See Figure 3

Detailed directions to each work site are located at the base trailer and at each work site.

27. Contingency Plans: Describe contingency plans for emergencies, including emergency signals and evacuation routes. If formal contingency plan document has been prepared, attach a copy.

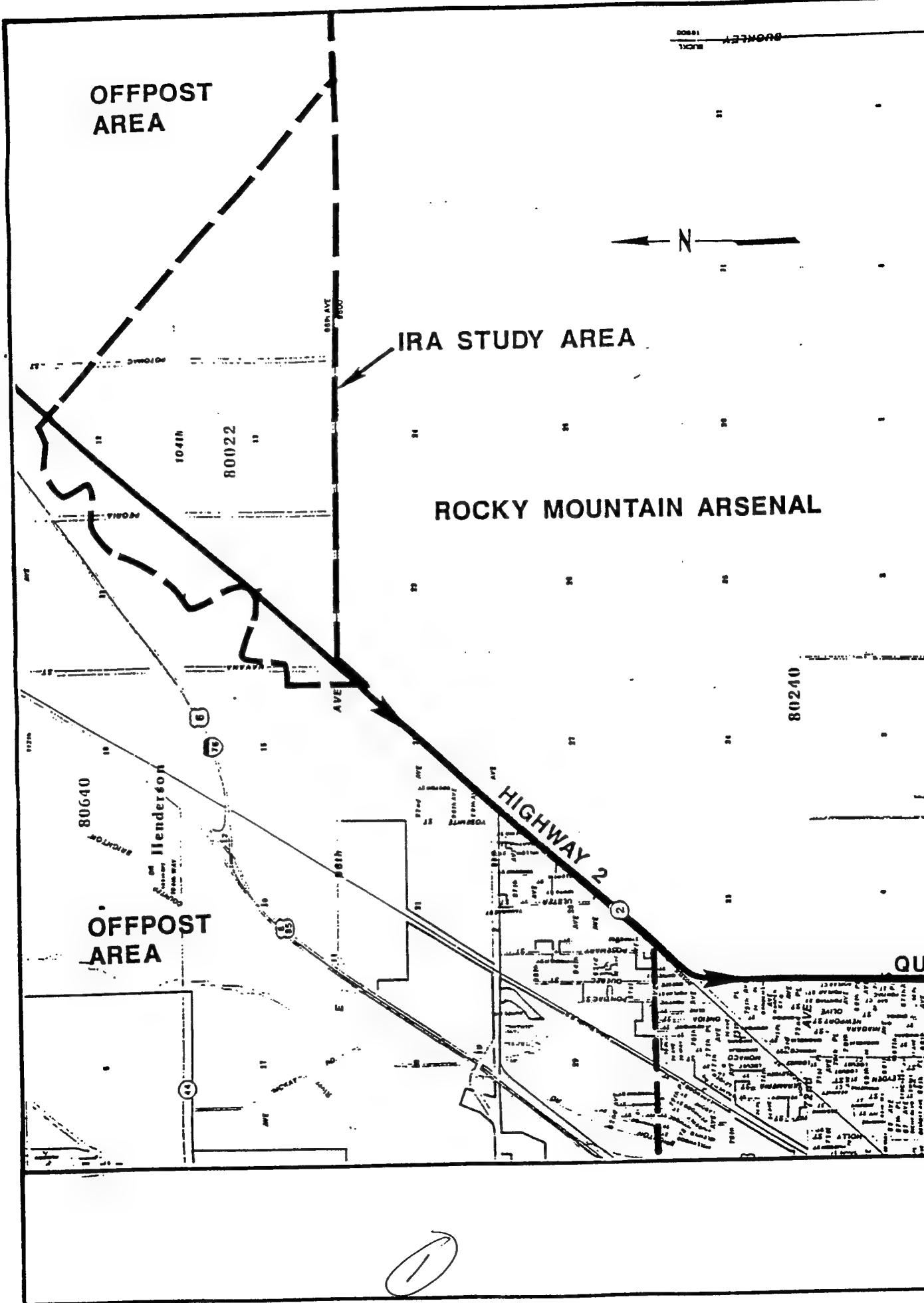
Actions to be taken in an emergency are described on p. B-6 of Appendix B. A formal contingency plan has not been prepared.

28. Project Personnel List and Safety Plan Distribution Record

28a. HLA employees

All project staff must sign a master copy of the following table, indicating that they have read and understand the HSP. A copy of this HSP will be kept in the base trailer at all times, and each site geologist and technician will keep a copy available at all times. If fit testing was conducted more than six months prior to field work, then fit testing will be rechecked prior to commencement of field work. Although CPR and first aid are not mandatory, HLA employees are afforded the opportunity to take these Red Cross courses. At least one HLA employee onsite will have CPR and first aid training and will be designated as the Site Safety Officer (SSO).

The SSO for this project is Scott Wibby.



Y AREA

MOUNTAIN ARSENAL

GHWAY

80240

QUEBEC ST

ADAMS COUNTY
DENVER COUNTY

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal Cleanup
Commerce City, Colorado

80239

I-70

PEORIA ST.

FITZSIMMONS
ARMY MEDICAL
CENTER

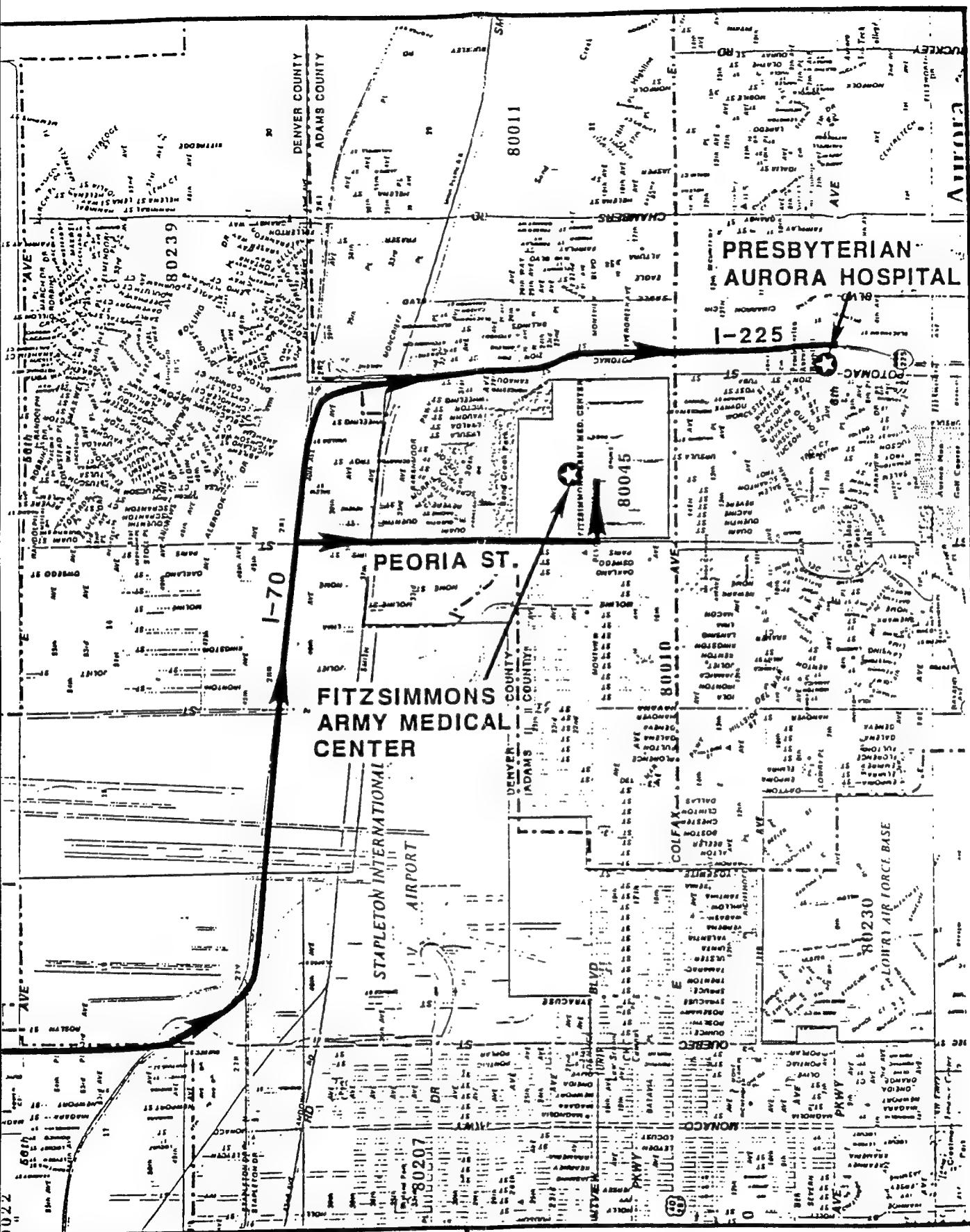
STAPLETON INTERNATIONAL

AIRPORT

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HOS

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80011



Prepared for:
**U.S. Army Program Manager's Office
 for Rocky Mountain Arsenal Cleanup
 Commerce City, Colorado**

Figure 3
HOSPITAL ROUTE MAP

PREPARED BY: HARDING LAWSON ASSOCIATES

20000,610.10

(3)

Employee Name and Title	Date of Hazmat or Other Applicable Safety and Health Training	Most Recent Annual Update	Supervisory Training	Date Distributed	Signature

28b. Contractors, Subcontractors

A copy of this Health and Safety Plan shall be provided to contractors and subcontractors who may be affected by activities covered under the scope of this Job Safety Plan. All contractors and subcontractors must comply with applicable OSHA, EPA, and local government rules and regulations.

The subcontractor supervisor at each work site will receive a copy of the HSP and will sign a master list to be maintained at the base trailer.

<u>Firm Name</u>	<u>Contact Person</u>	<u>Date Distributed</u>
-------------------------	------------------------------	--------------------------------

- 29. Health and Safety Meeting** - All personnel participating in the project must receive initial health and safety orientation. Thereafter, a brief tailgate safety meeting is required as deemed necessary by the Site Safety Officer.

All HLA and subcontractor personnel who attend the preliminary Health and Safety Meeting will initial a master list to be maintained at the base trailer.

<u>Date</u>	<u>Topics</u>	<u>Name of Attendant</u>	<u>Firm Name</u>	<u>Employee Initials</u>
-------------	---------------	--------------------------	------------------	--------------------------

30. **Visitor** - It is HLA's policy that visitors must furnish his/her own personal protective equipment. All visitors are required to sign the visitor log and comply with the safety plan requirements. If the visitor represents a regulatory agency concerned with job site health and safety issues, the Site Safety Officer shall also immediately notify DHSO.

No visitors, regardless of affiliation, will be allowed within the Exclusion Zone unless they have completed an OSHA-approved safety course and first sign the visitors' log stating this condition.

VISITOR LOG

<u>Name of Visitor</u>	<u>Firm Name</u>	<u>Date of Visit</u>	<u>Signature</u>
------------------------	------------------	----------------------	------------------

APPENDICES

Appendix A
HAZARDOUS PROPERTY INFORMATION

**HAZARDOUS PROPERTY INFORMATION
EXPLANATIONS AND FOOTNOTES**

- a. Water solubility is expressed in grams per 100 grams water at 20°C (e.g., 0.2g means 0.2 grams per 100 grams water at 20°C).
- b. Several chlorinated hydrocarbons exhibit no flash point in the conventional sense but will burn in the presence of a high-energy ignition source or will form explosive mixtures at temperatures above 200°F.
- c. TLV-TWA (Threshold Limit Value - Time Weighted Average) adopted by the American Conference of Governmental Industrial Hygienists. (Benzene TWA established by OSHA.)
- d. Hazard property
 - A - corrosive
 - B - flammable
 - C - toxic
 - D - volatile
 - E - reactive
 - F - radioactive
 - G - carcinogen
 - H - infectious
 - I - explosive
- e. Acute exposure symptoms .
 - A - abdominal pain
 - B - central nervous system depression
 - C - comatose
 - D - convulsions
 - E - confusion
 - F - dizziness
 - G - diarrhea
 - H - drowsiness
 - I - eye irritation
 - J - fever
 - K - headache
 - L - nausea
 - M - respiratory system irritation
 - N - skin irritation
 - O - tremors
 - P - unconsciousness
 - Q - vomiting
 - R - weakness
 - S - anorexia
 - T - temperature sensitivity
- f. Solubility of metals depends on the compound in which they are present.
- g. Explosive concentrations of airborne dust can occur in confined areas. This is not expected to occur during this investigation.

Appendix A - Table 1: Hazardous Property Information

Material	Solubility(a)	Water Solubility(a)	Specific Gravity	Vapor Density	Flash Point(b)	Vapor Pressure @ 20°C (mmHg)	LEL/UEL (%)	TLV-TWA(c)	IDLH Level	Hazard Property(d)	Acute Exposure Symptoms(e)
MISCELLANEOUS											
Aldrin	Insoluble	--	--	--	6x10 ⁻⁶	--	--	0.25 mg/m ³	100 mg/m ³	CG	HCDWIKLMNPQ
Chlordane	Insoluble	--	--	--	1x10 ⁻⁵	7.4/12.5	0.5 mg/m ³	500 mg/m ³	CG	ADEGLOQ	
Dibromochloropropane	0.1g	--	--	170	0.8	--	1 ppb	125 ppm	CG	HILMNQ	
Dicyclopentadiene	Insoluble	--	--	--	1.4	--	5 ppm	--	BC	--	
Diieldrin	Insoluble	--	--	--	1.8x10 ⁻⁷	--	0.25 mg/m ³	450 mg/m ³	CG	CDFKLQ	
Diisopropylmethylpropane	Soluble	--	--	--	0.28	--	--	--	--	IN	IN
Dithiane	Soluble	--	--	--	0.8	--	--	--	--	--	--
Endrin	Insoluble	--	--	--	2x10 ⁻⁷	--	0.1 mg/m ³	200 mg/m ³	CG	ADFKLQ	
Chlorophenyl Methylsulfide	Slightly	1.2	--	--	0.11	--	--	--	--	BGRST	GNS
Chlorophenyl Methylsulfone	Soluble	--	--	--	5x10 ⁻⁴	--	--	--	--	BGIRST	DEFIKOQ
p,p'-DDT	Insoluble	--	--	--	8x10 ⁻⁴	--	--	--	--	C	DEFIKOQ
					1.7x10 ⁻⁷	--	1 mg/m ³	--			

Appendix A - Table 1: (Continued)

Material	Water Solubility(*)	Specific Gravity	Vapor Density	Flash Point	LEL/UEL (%)	TLV-TWA(°) (mg/m ³)	IDLH Level (mg/m ³)	Hazard Property(a)		Acute Exposure Symptoms(*)
								(g)	(g)	
METALS										
Arsenic	(t)	5.72	N/A	None	N/A	(g)	0.2	None specified	CEG	ACDGJMOQR
Cadmium	(f)	8.642	N/A	None	N/A	(g)	0.05	40	CGI	ABGHJKLMNQR
Chromium	(t)	7.20	N/A	None	N/A	(g)	0.5	500	C	FMNQ
Copper	(e)	8.92	N/A	None	N/A	(g)	1	None specified	CI	FGIJMOQR
Lead	(t)	11.34	N/A	None	N/A	(g)	0.15	None specified	CI	ACDFGKQR
Mercury	(e)	13.59	7.0	None	0.0012	--	0.1	28	C	AGLMNQ
Zinc	(t)	7.14	N/A	None	N/A	(g)	None specified	None specified	CI	DF

Appendix A - Table 1 (Continued)

Material	Water Solubility(•)	Specific Gravity	Vapor Density	Flash Point(•)	Vapor Pressure @ 20°C (mmHg)	LEL/UEL (%)	TLV-TWA(^c) (ppm)	IDLH Level (ppm)	Hazard Property(•)	Acute Exposure Symptoms(•)
VOLATILE ORGANIC COMPOUNDS										
Benzene	0.18g	0.87	2.8	12	75	1.3/7.1	1	2000	BCDG	BCDFHIKLMNQOPR
Carbon Tetrachloride	0.08g	1.59	5.3	None	9	Nonflammable	5	300	BCDI	ABCFGHKNQ
Chlorobenzene	0.01g	1.11	3.9	84	8.8	1.3/9.6	75	2400	BCD	BCFIKLMNQOPQR
Chloroform	0.8g	1.48	4.12	None	160	Nonflammable	10	1000	CD	BCEGIKLMN
1,1-Dichloroethane	0.19	1.17	8.4	22	182	6/16	100	4000	BCD	ABHIMNO
1,2-Dichloroethane	0.8g	1.26	3.4	55	87	6.2/16	10	None specified	BCD	BIMN
1,1-Dichloroethylene	0.22g	1.22	3.4	3	591	7.3/16	5	None specified	BCD	BIMN
t-1,2-Dichloroethylene	0.06g	1.25	--	36	400	9.7/12.8	200	None specified	BCD	ABFILOQ
Ethylbenzene	0.015g	0.86	3.7	59	7.1	1.0/6.7	100	2000	BCDI	ABFHJKLMNPQR
Methylene Chloride	1.3g	1.33	2.9	None	350	12/19	100	5000	CEDI	BCKJLMNPR
Tetrachloroethylene	0.7g	1.62	5.8	None	15.8	Nonflammable	50	500	CDI	ACFNJKLMNP
1,1,1-Trichloroethane	0.7g	1.33	4.6	None	100	8.0/10.5	350	10000	ECEDI	ABEFGHIKLNOP
Trichloroethylene	0.1g	1.46	4.5	90	58	12.5/90	50	1000	BCI	EFKLMMOPQ
Toluene	0.05g	0.86	3.2	40	22	1.3/7.1	100	2000	BCI	BEFFHIKLMNPQ
Xylene	0.00003g	0.86	3.7	84	9	1.1/7	100	10,000	BCDI	ABFHIKLMNPQ

**Appendix A - Table 2: U.S. Environmental Protection Agency:
Maximum Contaminant Levels (MCLs) and
Proposed Maximum Contaminant Level Goals (MCLGs)
for Public Drinking Water**

Aldrin		
Arsenic	50 µg/l	MCL
Cadmium	10 µg/l	Proposed MCLG
Chlordane	0	Proposed MCLG
Chromium	120 µg/l	Proposed MCLG
Copper	1300 µg/l	Proposed MCLG
Dibromochloropropane (DBCP)	0	Proposed MCLG
DCPD		
Dieldrin		
DIMP		
Dithiane		
Endrin	0.2 µg/l	MCL
DDT		
Lead	50 µg/l	MCL
Mercury	3 µg/l	Proposed MCLG
Zinc		

Volatile Organic Aromatics

Benzene	5 µg/l	MCL
Chlorobenzene		
Ethylbenzene	680 µg/l	Proposed MCLG
Toluene	2000 µg/l	Proposed MCLG
Xylenes	440 µg/l	Proposed MCLG

Volatile Organic Halogens

Carbon tetrachloride	5 µg/l	MCL
Chloroform	100 µg/l	MCL (as total trihalomethanes)
1,1-Dichloroethylene	7 µg/l	MCL
1,1-Dichloroethane		
1,2-Dichloroethane	5 µg/l	MCL
t-1,2-Dichloroethylene	70 µg/l	MCL
1,1,1-Trichloroethane	200 µg/l	MCL
1,1,2-Trichloroethane		
Trichloroethylene	5 µg/l	MCL
Tetrachloroethylene	0	Proposed MCLG

Appendix B
HEALTH AND SAFETY PROGRAM

HEALTH AND SAFETY PROGRAM

Safety Training Requirements

To ensure an understanding of and adequate protection against the potential hazards involved, all site personnel will have participated in a safety training class that meets OSHA standards (29 CFR, Part 1910.120, Paragraph [E]). Site personnel includes drillers, helpers, field engineers, geologists, technicians, and onsite supervisors. HLA is not responsible for the training of subcontractor employees, but these individuals will be required to conform to OSHA standards. Site visitors should be accompanied by a person who has completed safety training, but they will not be permitted inside the Exclusion Zone unless they have completed a hazardous materials training course meeting OSHA requirements. The Exclusion Zone is defined as the area where the project task is being performed with a 30-foot radius buffer zone surrounding it.

At a minimum, the safety training required by HLA addresses the following topics:

- General overview of toxicology and hazard evaluation
- Overview of toxic properties of the hazardous materials possibly present at the site
- Overview of health and advisory limits and occupational standards
- Discussion/demonstration of environmental monitoring equipment to be employed
- Discussion/demonstration/practical session with the PPE to be used
- Discussion of site entry and site control practices and requirements
- Discussion of decontamination procedures to be employed
- Discussion of contingency planning and emergency response
- Discussion of field activities to be conducted and potential hazards relative to each
- Practical session with safety, PPE, and decontamination procedures

Training requirements for all personnel will be a 40-hour safety course and a minimum of three days of on-the-job training under the direct supervision of a trained and experienced supervisor. All managerial personnel will be required to attend an additional eight-hour training course specifically for management of hazardous waste operations. Attendance at the 40-hour

safety course can be waived only if the individual has previous documented experience in hazardous waste site work equivalent to the 40-hour safety course. All personnel will be required to attend an eight-hour annual refresher course. Records and certifications will be maintained for all personnel attending the classes.

Medical Monitoring

All HLA field employees will receive a yearly comprehensive medical evaluation to qualify for hazardous waste site assignments. These employees receive exit medical examinations at the termination of their employment with HLA. Medical records of HLA employees are kept on file at HLA's Denver, Colorado, office or at the office of the examining physician. HLA is not responsible for subcontractor medical monitoring; however, subcontractors are expected to monitor their employees according to OSHA standards.

Medical monitoring will include a medical and work history for each employee. A determination of the fitness of the employee to wear required PPE for site work will be made. The examining physician will be given a copy of OSHA Regulations 29 CFR 1910.120, employee duty description, anticipated exposure levels, PPE to be used, and any applicable information from previous medical examinations. A copy of the examining physician's written opinion of the employee's fitness for hazardous duty will be given to the employee.

Safety Plan Implementation and Modification

Before any activities begin on or around the site, a meeting will be held with all site personnel to discuss safety procedures and to familiarize personnel with the site's potential hazards. Any changes in the HSP will be discussed with the Denver DHSO before being applied at the site. All site personnel will be informed both verbally and by written memorandum of all changes.

The SSO will conduct inspections of the site on a frequent and regular basis. Should any operation, practice, or equipment not pass inspection, the SSO will notify the DHSO and will have the authority to cease operations and/or remove faulty equipment. Unacceptable practices and/or

faulty equipment will be remedied immediately, and the HSP will be modified to correct any deficiencies in the effectiveness of the plan.

Standard Operating Procedures

The following Standard Operating Procedures (SOPs) have been developed to minimize hazards to site personnel. The SSO has authority on all day-to-day health and safety issues.

- Eating, smoking and/or chewing tobacco, or chewing gum in the Exclusion Zone¹ and CRZ² is prohibited. It is also prohibited in the Support Zone³ until the hands and face have been washed upon return from the Exclusion Zone.
- The number of personnel in the Exclusion Zone will be limited to the minimum necessary to complete the required work action. No visitors without adequate safety training will be permitted inside the Exclusion Zone or the CRZ.
- All field personnel will be located upwind of any field activity, if possible.
- The Exclusion Zone will be clearly marked with flagging or traffic cones and enclose a circle with a minimum radius of 30 feet. Entrance to this area will occur only while in proper PPE and with a "buddy". The "buddy system" will also be in effect at any work zone where respirators are being worn.
- While in the Exclusion Zone, all personnel will avoid contact with objects or soils unless the contact is necessary to the field operation.
- Eyewash units and emergency showers will be located as close as possible to the source of hazard.
- Smoking and other means of ignition (e.g., sparking equipment) will be prohibited in the Exclusion Zone and the CRZ and wherever flammable liquids are present.
- If ambient air concentrations in the breathing zone rise above background, the site will be evacuated until concentrations have dropped to background again or until provisions for the appropriate respiratory protection are made as indicated below.
- Respirator protection will be determined as follows:
 - o Above zero (background) up to 5 ppm - respirators with combination cartridges will be worn.

¹Definition found on Page B-1.

²Defined as the area where procedures are taken to remove contaminants from personnel (e.g., removing PPE).

³The support zone is the area outside both the Exclusion Zone and the CRZ where no PPE is required and visitors are required to remain.

- 5 ppm up to 500 ppm - SCBAs or an air line system of supplied air will be utilized.
 - 500 ppm or above - a fully encapsulating suit must be worn.
 - Particulates in the breathing zone - respirators with combination cartridges will be worn.
- The effects of heat stress will be carefully monitored and rests and liquids taken during hot weather, as appropriate, particularly when working while wearing respiratory protection and nonporous protective clothing.

Site Control

As discussed in the SOPs, no person without adequate safety training will be permitted to enter the Exclusion Zone. The Exclusion Zone will be clearly marked with flagging or traffic cones. Anyone entering this area will be required to don the appropriate PPE. Before exiting the site, personnel will remove and/or decontaminate PPE in the CRZ.

The CRZ will be a temporary zero-discharge decontamination area established at each work site for decontamination of PPE and all small equipment. The onpost decontamination pad will be used for steam cleaning large downhole equipment, field vehicles, and the drill rig. Any discharge collected at the CRZ will be pumped into barrels for storage onsite. Barrels for disposal of used PPE, wash tubs, brushes, and any other equipment necessary for decontamination will also be available.

Air Monitoring

An HNu photoionization detector will be used to monitor ambient air for breathing zone contaminants. If ambient air concentrations in the breathing zone rise above zero or background, PPE will be upgraded and respirators will be donned, as indicated under SOPs. If the ambient air concentrations continue to rise and meet or exceed 5 ppm, all field activities will cease and all personnel will exit the site through the CRZ. Re-entrance to the site will not be permitted until ambient air concentrations have dropped to less than 5 ppm or, if ambient air concentrations do not drop, until provisions for upgrading PPE to Level B have been made. Level B PPE is

acceptable up to 500 ppm. If ambient air concentrations exceed 500 ppm, Level A protection must be employed.

Personal air monitoring will be conducted periodically for individuals likely to have the greatest exposure. The SSO and the DHO will determine who should be monitored, how often, and what chemical analyses will be performed.

Calibration and Maintenance of Monitoring Equipment

Calibration of the HNu will be performed on a daily basis prior to the initiation of field activities. The rechargeable battery will also be checked at the end of the day and will be recharged overnight if the charge is low.

This equipment will be calibrated and maintained by the SSO in accordance with maintenance and calibration procedures specified in the manufacturer's/owner's/operator's manual. Details for maintenance and calibration are included in Appendix C.

Respiratory Protection

The cartridges to be used during this project will be Scott 642-OV-H or equivalent. These cartridges are approved against atmospheres containing:

- Pesticides
- Mists of paints, lacquers, and enamels
- Organic vapors (not exceeding 1000 ppm by volume)
- Dusts, fumes, and mists having a time-weighted average less than 0.05 milligrams per cubic meter
- Asbestos-containing dusts and mists
- Radionuclides and radon daughters attached to dusts, fumes, and mists or any combination of the above

Cartridge respirators will be worn at any time ambient air concentrations rise above background up to but not including 5 ppm or when dust is present in the breathing zone. If ambient air concentrations equal or exceed 5 ppm, personnel will exit the site until provisions to

upgrade PPE have been made. Re-entrance to the site with ambient air concentrations at 5 ppm or above will be permitted only in Level B PPE (SCBA or air line system). Level B protection will be required until ambient air concentrations have dropped below 5 ppm. If ambient air concentrations continue to rise and meet or exceed 500 ppm, Level A (fully encapsulating suit) must be utilized to continue field activities.

A written respiratory protection program is presented in Appendix D.

Emergency Response

All field personnel working on this project will be given a copy of the HSP. This plan will be discussed in a safety meeting prior to commencement of field activities. Action to be taken in an emergency situation will also be discussed in this meeting.

In the unlikely event that an emergency situation occurs, all field activities at that site will cease. If the emergency occurs in the Exclusion Zone, all field personnel will quickly move to the CRZ for a complete decontamination before exiting to the Support Zone. In life-threatening emergencies, decontamination may not be appropriate. Emergency situations occurring outside of the Exclusion Zone in Level D protection will not require decontamination at the CRZ before administration of first aid.

Minor emergencies will be handled within the Support Zone utilizing the onsite first aid kit. An emergency pressure eyewash and a portable mini decontamination shower will also be available at the base trailer. At least one onsite HLA person will be trained in first aid and CPR. The appropriate emergency response personnel (ambulance, fire department, etc.) will be contacted for all major emergencies. Each work site will be equipped with a CB radio in order to contact the SSO in the event of an emergency.

The route to the nearest hospital is shown in Figure 3. An alternate route is also shown. Detailed directions to each site will be maintained by the SSO. A written report of all emergencies will be submitted to HLA's Denver office, and to the appropriate agencies.

Written reports of all emergencies will be prepared as indicated in the following section.

Accident Investigations

All accidents that affect the health or safety of HLA personnel and/or subcontractors will be investigated, and corrective actions will be taken to prevent similar accidents. All accidents will be investigated, particularly those that result in fatalities, disability, property damage, fire, explosion, lost work time, treatment at a medical facility, examination by a medical doctor, nurse, or paramedic, or unexpected exposure to chemical agents or hazardous materials. HLA's internal accident investigation policy is presented at the end of this section.

An additional accident/incident investigation report will be completed by the Health and Safety Coordinator (designated on page 1).

This report will include, at a minimum, the following information:

1. Contractor involved and telephone number
2. Name and title of the person reporting
3. Date and time of the accident or incident
4. Location (e.g., work site location, facility name, building number)
5. A brief summary giving pertinent details, including type and quantity of material and type of operation
6. Cause, if known
7. Casualties (fatalities, disabling injuries, exposure to chemical or biological agents or radiation)
8. Details of any known chemical hazard or other hazardous material or contamination
9. Estimation of property damage, if applicable
10. Nature of the damage; effect on production, operations, training or other activities
11. Actions taken to ensure safety and security
12. Other damage or injuries sustained (public or private)
13. Whether a release was made to news media; if so, a copy of the published article or statement will be attached
14. Any indication of sabotage or espionage, including possible theft, loss of chemical agent, or agent-filled munitions
15. Any other pertinent information, including causal factors, if they are known, and any possible political implications

16. Type of carrier, if one was involved
17. Whether assistance was required; if so, the nature of such assistance will be indicated

If equipment malfunction is involved, the Accident or Incident Report will contain the following information in addition to that listed above:

1. Equipment name
2. Quantity involved
3. Production lot number(s)
4. Availability of replacement equipment and time estimate to continue activity

This report, which will fulfill Army Data Requirement A012, will be submitted to Mr. Charles Scharmann, Remedial Planning Division, Office of the Program Manager for Rocky Mountain Arsenal, Department of the Army.

If an accident occurs, it will immediately be reported to the SSO who will in turn notify the Task Manager and the Health and Safety Coordinator. Accident reports will be conducted as discussed above through an onsite investigation. The scene of the accident will be examined, and witnesses will be interviewed. Accidents of a non-serious nature (not resulting in or not likely to result in serious bodily harm or death) will be acted upon within five working days. Responses to accidents of a serious nature (serious injury or death, chemical releases, fire) will be immediate and will include notification of affected parties.

Compliance and Audit Procedures

Audits and onsite inspections of work practices, equipment, records, and personnel knowledge of health and safety issues identified in the HSP may be either announced or unannounced. Formal audits will be conducted at least quarterly by the Health and Safety Coordinator. Infractions or violations of established health and safety procedures will be corrected immediately and disciplinary action will be enforced when appropriate. Audit reports will be available for inspection. The SSO will be responsible for monitoring health and safety

issues on a daily basis. The Health and Safety Coordinator will be immediately notified regarding problems and questions.

HLA corporate industrial hygiene and safety staff will periodically conduct unannounced health and safety audits to check compliance. Audit frequency will depend on work activities and level of risk.

Appendix C

EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

This section addresses the standard operating procedures for use and maintenance of field equipment used during field activities. The equipment is described, and the calibration, field checking, operations, and maintenance procedures are detailed to the extent necessary to properly maintain each item. Detailed procedures are provided in the manufacturer's manual.

A program has been developed to ensure that equipment is properly maintained. This program has been developed on the following premises:

- Procedures are in accordance with the manufacturers' maintenance and calibration guidelines.
- All equipment calibration, operation and maintenance procedures, and field checking procedures defined herein will be performed by properly trained HLA personnel.
- Only designated personnel may calibrate, operate, and maintain certain instruments (e.g., HNu).
- Records will be maintained to allow tracking of the calibration, operation, and maintenance history of a given instrument or item of equipment.

Photoionization Detector (HNu, Model PI 101, or equivalent)

The HNu will be used to measure the concentration of trace gases present in ambient air. Instructions specified by the manufacturer in the owner's/operator's manual will be followed in calibration, operation, and maintenance procedures.

Calibration will be performed daily prior to initiating field activities. The meter's battery will also be checked daily at the end of each day's field activities and will be recharged overnight, if necessary. Calibration is begun by attaching the HNu to a pressurized container of calibration gas by means of a narrow, flexible hose and turning on the gas. If the meter reading does not approximately match that of the gas rating, the span must be adjusted until the reading is almost identical to the rating.

Personal Monitoring Pumps (SKC Model 224-43 or equivalent)

All pumps will be fully charged prior to calibration and use. Calibration will be performed before and after each sampling event by using a soap bubble buret and measuring the time required for a bubble to pass between two scale markings. Sampling assemblies (i.e., charcoal adsorption tube, filter cassette) will be placed in line during calibration. Maintenance will be performed according to the manufacturer's recommendations.

Appendix D
RESPIRATORY PROTECTION PROGRAM

RESPIRATORY PROTECTION PROGRAM

Respirator Administration

The Respiratory Protection Program Coordinator is the DHSO for the Denver, Colorado, office (currently Marcus W. Johnshoy). This program became effective on April 1, 1987.

Responsibilities of the Respiratory Protection Program Coordinator include selection and purchase of respirators, organization of training, and administration of the program to include use, maintenance, storage, and sanitary care.

The project managers/supervisors will supervise the program for their jobs and in their areas of supervision. The DHSO will be responsible for issuing respirators and enforcing their use.

Respirator Selection

Respirators will be selected by the DHSO in cooperation with the project manager/supervisor. Only respirators approved by NIOSH will be selected for use based upon the nature of the hazard and its concentration.

Typical jobs and types of respirators used at HLA:

<u>Job</u>	<u>Type of Respirator</u>
Soil sampling in potentially pesticide contaminated area	Scott Model #65, full-face, Scott Model #66, half-face 642-OA-H cartridge
Monitor well installation and sampling in potentially solvent contaminated areas	Scott Model #65, full-face, Scott Model #66, half-face 642-OA cartridge

Respirators will be purchased from an authorized manufacturer's representative. Employees will be provided the brand and model of respirator indicated on the employee's fit test record.

Respirator Assignment

Respirators will be individually assigned and marked with a unique identification number.

Respirator Training

Training will be conducted during the employee's Hazardous Materials Health and Safety Training or at time of issue. Training will include respiratory hazards; alternate engineering/administrative controls; respirator types based on hazard, functions, capabilities, and limitations of respirators; donning and fit testing; proper wearing; and maintenance. If necessary, training will be conducted by the DSHO using the following training aids and materials:

- Manufacturer's Instructions
- HLA's Health and Safety Training Manual
- Hands-on training and formal presentations during safety training
- American National Standards Institute's Practices for Respiratory Protection - Z88.2, 1980
- Occupational Safety and Health Administration Standards

Respirator Cleaning/Sanitization

Each employee will be responsible for cleaning his/her respirator. A sink, detergent, and sanitizer for respiratory cleaning and sanitizing will be available at the decontamination facilities or at HLA's Denver office.

Respirator Inspection and Maintenance

Individually assigned respirators will be inspected on a regular basis by the DSHO. A log of these inspections will be maintained in the respirator record files.

Respirator repairs and maintenance will be performed by the DSHO and/or approved alternate or a factory authorized representative. There will be no replacement of parts or repairs beyond the manufacturer's recommendations.

Respirator Storage

Between use, respirators will be stored in sealable plastic bags where they will be protected from dust, chemicals, sunlight, and extreme heat, cold, or moisture.

Program effectiveness will be evaluated through regular inspections of each area where respirators are used and stored. The DHO or SSO will be responsible for evaluation of program effectiveness.

Respirator Records

Records for the respirator program will be maintained in the Health and Safety office files.

The records will include:

1. Approximate numbers and types of respirators in use
2. HLA respirator user approval form
3. Medical evaluation sheet
4. Program surveillance and maintenance reports
5. Respirator inspections logs

Appendix E
ACRONYMS AND REFERENCES

ACRONYM LIST

CDH	Colorado Department of Health
CRZ	Contamination Reduction Zone
DBCP	Dibromochloropropane
DCPD	Dicyclopentadiene
DHSO	Designated Health and Safety Officer
DIMP	Diisopropylmethylphosphonate
EPA	U.S. Environmental Protection Agency
HLA	Harding Lawson Associates
HNu	HNu photoionization detector
HSP	Health and Safety Plan
MCLs	Maximum Contaminant Levels
MCLGs	Maximum Contaminant Level Goals
NIOSH	National Institute for Occupational Safety and Health
NWBCS	Northwest Boundary Containment System
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PPE	Personal Protective Equipment
RIC	Rocky Mountain Arsenal Information Center
RMA	Rocky Mountain Arsenal
SCBA	Self-Contained Breathing Apparatus
SOP	Standard Operating Procedures
SSO	Site Safety Officer
TLV	Threshold Limit Value

REFERENCES

American Conference of Industrial Hygienists, 1987-1988, TLVs - Threshold Limit Values for Chemical Substances in the Work Environment, ACGIH, Cincinnati, Ohio.

Condensed Chemical Dictionary, 10th edition, 1981, revised by G. G. Hawley.

Ebasco Services, Inc. et al., 1987, Toxicity Assessment for RMA Target Contaminants, Draft Final Report.

Environmental Science and Engineering, 1988, Offpost Operable Unit Endangerment Assessment/Feasibility Study with Applicable or Relevant and Appropriate Requirements, Draft Final Report, Version 2.1.

Environmental Science and Engineering, December 1988, Offpost Operable Unit Remedial Investigation and Chemical Specific Applicable or Relevant and Appropriate Requirements, Final Report, Version 3.1.

Harding Lawson Associates, 1985, Job Safety Planning System for Hazardous Waste Investigations.

Hazardline (A Computerized Database of OSHA and NIOSH Environmental and Chemical Hazard Information), Operated by Occupational Health Services, Secaucus, New Jersey.

Hazardous Chemicals Data Book, 1980, Edited by G. Weiss, Environmental Health Review No. 4.

NIOSH/OSHA, 1987 Pocket Guide to Chemical Hazards, edited by F. W. Mackison, R. S. Stricoff, L. J. Partridge, Jr., A. D. Little, Inc.

Registry of Toxic Effects of Chemical Substances, 1985-1986, U.S. Department of Health and Human Services.

R.L. Stollar and Associates, Inc. et al., 1988, Rocky Mountain Arsenal Comprehensive Monitoring Program health and Safety Plan.

Sax, N. I., 1984, Dangerous Properties of Industrial Materials, Sixth Edition, Van Nostrand Reinhold Company, New York, New York.

Sax, N. I., and Lewis, R. J., Jr., 1987, Hawley's Condensed Chemical Dictionary, Eleventh Edition, Van Nostrand Reinhold Company, New York, New York.

Scott Aviation, June 1983, A Figgie International Company, Product limitations listed on the respirator cartridge package label, Lancaster, New York, June 1983.

U.S. EPA, 1988, Phase II RI/FS Data Summary Technical Memorandum No. 4 - Waste Pit and Refuse Well Point Liquid Sampling Analysis.

U.S. EPA, 1988, Phase II RI/FS Data Summary Technical Memorandum No. 7 - Shallow and Upper Dawson Well Pump Installation and Ground-Water Sampling.